Feb. 26, 1935. M. MALLORY 1,992,383

IGNITION TIMER

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Fig. 1

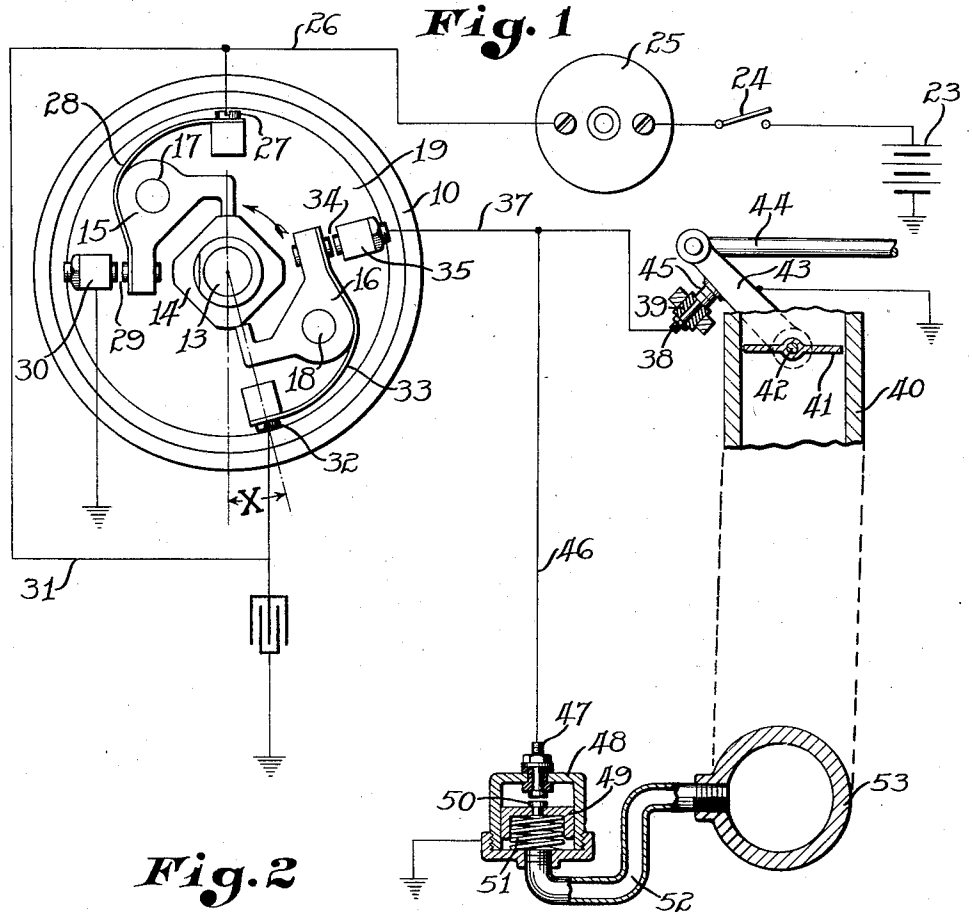
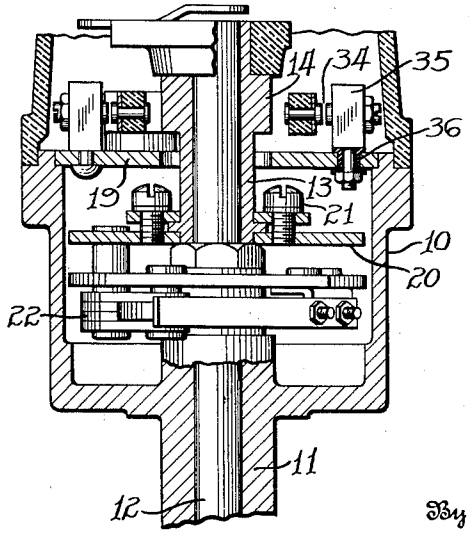


Fig. 2



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Fig. 3

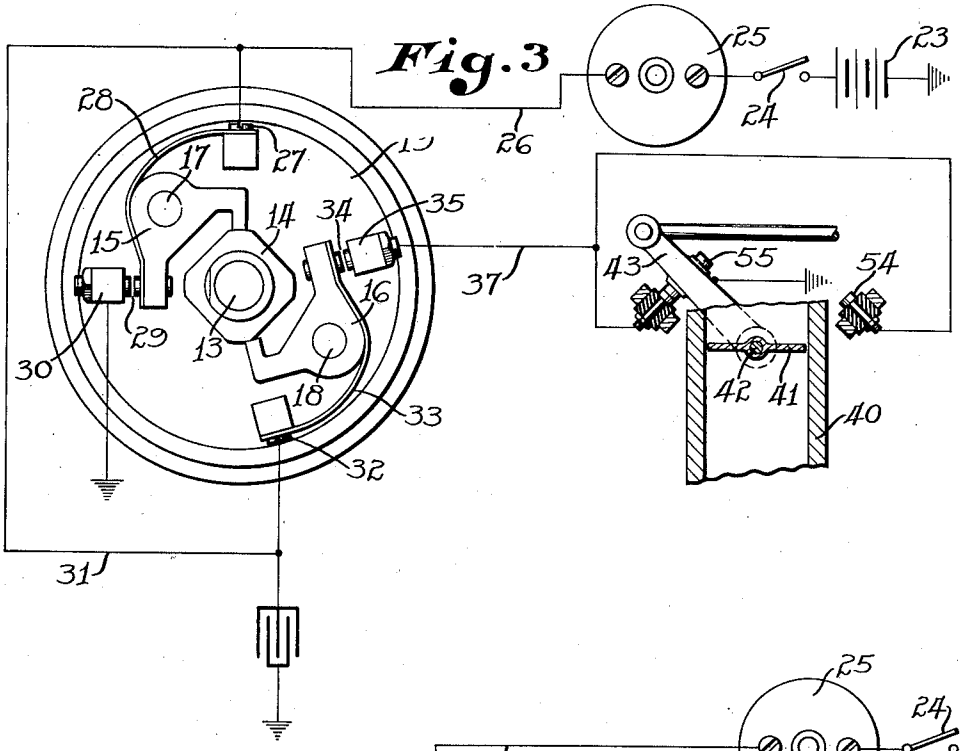
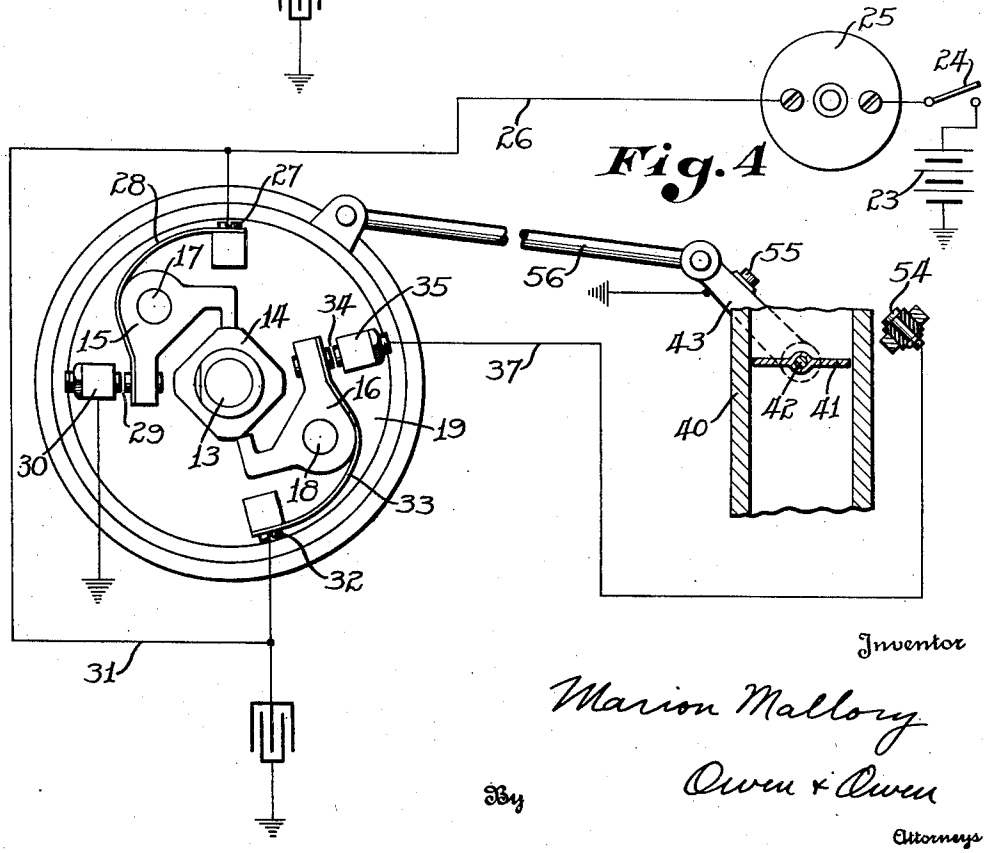


Fig. 4



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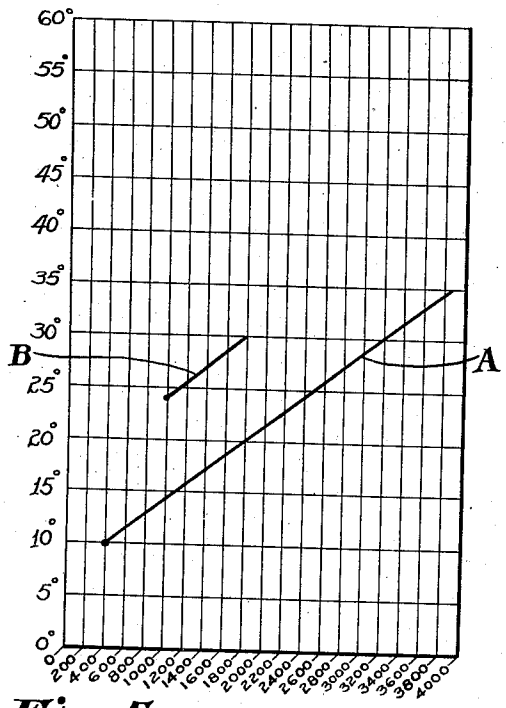


Fig. 5

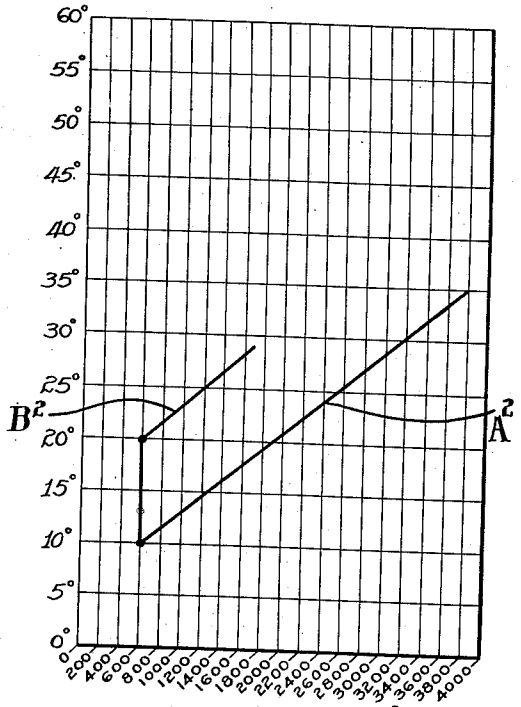


Fig. 6

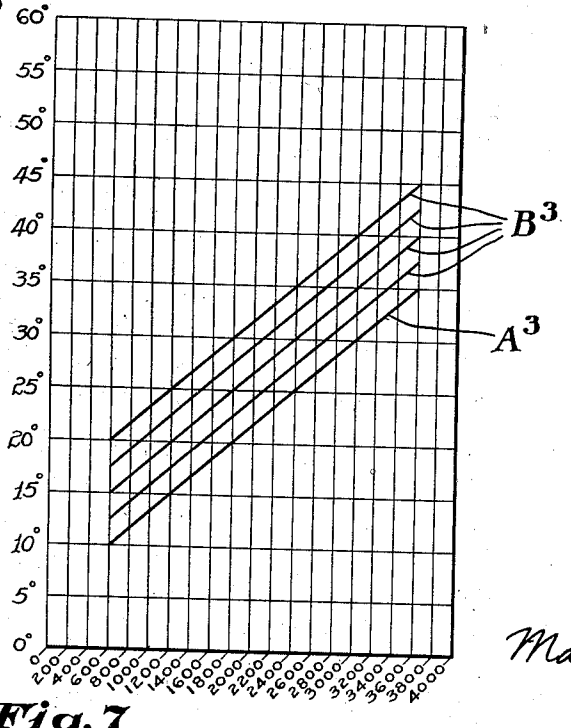


Fig. 7

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Patented Feb. 26, 1935 1,992,383

UNITED STATES PATENT OFFICE

1,992,383

IGNITION TIMER

Marion Mallory, Detroit, Mich., assignor to The Mallory Research Company, Toledo, Ohio, a corporation of Delaware

Application February 6, 1933, Serial No. 655,373

5 Claims. (Cl. 123—117)

This invention relates to the timing of the ignition for internal combustion engines, and its object is to provide improved means, dependent for its operation upon the position of the throttle or upon the amount of vacuum developed in the intake manifold, to modify the timing, in addition to the usual speed responsive control.

The invention is associated with a timing device having a primary circuit with two electrically parallel branches, each branch having a circuit breaker and so arranged that one circuit breaker opens in advance of the other. Under average driving conditions, one of these branches is normally open and, with the throttle in a predetermined intermediate position, the timing is dependent entirely upon the speed controlled opening of the circuit breaker in the other branch. Under certain conditions, however, the normally open branch is closed, and the circuit breaker therein opens later than the other circuit breaker, thus retarding the spark and also increasing the length of the closure period.

The characteristic features of the invention, and the advantages thereof, will be more particularly described in connection with the accompanying drawings, in which

Fig. 1 is a diagrammatic view illustrating one form of the invention;

Fig. 2 is a vertical sectional view of the distributor with which the invention is associated;

Fig. 3 is a diagrammatic view similar to Fig. 1, but illustrating a modified form of the invention;

Fig. 4 is a diagrammatic view illustrating another modification of the invention;

Fig. 5 represents a chart illustrating the spark advance according to the arrangement shown in Fig. 1;

Fig. 6 represents a chart illustrating the spark advance according to the arrangement shown in Fig. 3;

Fig. 7 represents a chart illustrating the spark advance according to the arrangement shown in Fig. 4.

As shown in the drawings, the invention is associated with an ignition timer comprising a housing 10 formed with a bearing 11 for the timer shaft 12. A sleeve 13 is mounted for relative circumferential movement on the shaft 12 and is provided with a cam 14 for actuating the circuit breaker. In the present adaptation of the invention there are two circuit breakers 15 and 16 of insulating material mounted for rocking movement on studs 17 and 18 respectively, which project upwardly from a plate 19 mounted within the housing 10.

The relative position of the sleeve 13 and cam 14 with reference to the timer shaft 12 is normally controlled through the medium of a plate 20, which is secured to the sleeve by screws 21 or other suitable means and advanced circumferentially by means of a centrifugal governor 22 as the speed increases. The present invention, however, is applicable to various types of timers, regardless of the specific speed responsive device.

As shown in Fig. 1, when the engine is operating with the throttle partly or wholly open, there is a primary ignition circuit from the battery 23 through the ignition switch 24, a spark coil 25 and line 26 to the terminal 27, thence through a spring 28, contact points 29 and terminal 30, which is grounded, back to the battery.

The primary ignition circuit also has a branch 31 leading to a terminal 32, thence through a spring 33 and contact points 34 to a post 35 which is insulated from its support as indicated at 36 in Fig. 2. The post 35 is also connected by a line 37 to a post 38, which is also insulated, as shown at 39 in Fig. 1.

The post 39 is located on or near the intake passageway 40 and near the throttle valve 41. The valve 41 is secured to a pivot pin 42, to which a crank arm 43 is also secured, the end of the arm 43 being connected to a throttle control rod 44. The arm 43 carries a contact point 45 which engages the post 38 and completes a supplementary ignition circuit through the contact points 34, only when the throttle valve 41 is in position for idling. It is to be noted that the contact points 34 open later than the contact points 29, as indicated by the angle X in Fig. 1. This connection, therefore, is adapted to cause an extra retardation of the timing when the throttle is closed for idling, but immediately ceases to function as soon as the throttle begins to open.

The line 37 is also connected by a branch 46 with a contact 47 which is anchored in a valve housing 48. A valve 49 within the housing 48 has a contact 50 adapted to engage the contact 47 under the influence of a spring 51, thus completing a circuit through the contact points 34 and branch 46 to cause an extra retardation of the spark under certain conditions, even though the throttle is partly or wholly open. The valve chamber 48, however is in communication through a conduit 52 with the intake manifold 53, to which the passageway 40 leads, and when the engine is operating fast enough to create a predetermined vacuum in the intake manifold, it will overcome the tension of the spring 51 and

open the contacts 50, so that the delayed timing ceases to function.

When the throttle is partly or wholly open so that the contacts 45 are open, and if the engine is operating at a normal speed as compared with the speed of the throttle, the contacts 50 will also be open and the timing will be advanced, as indicated by the graph B in Fig. 5, to give the most efficient results.

Now, if the throttle is suddenly opened sufficiently to cause a collapse of the vacuum in the intake manifold, or if such a load is imposed on the engine as to slow it up considerably, the contacts 50 will close and the spark will be retarded as indicated by the graph A. Thus it will be seen that whenever the engine is operating under a heavy load or whenever for any reason the engine is operating slowly as compared with the position of the throttle, as for example, when the throttle is opened suddenly, the spark is temporarily retarded by the delayed breaking of the primary circuit through the contacts 34, until the speed of the engine increases sufficiently to cause a predetermined degree of vacuum in the intake manifold, thus preventing a spark knock. The contacts 45 also insure a retardation of the spark and a smooth performance with the engine is idling.

With the arrangement shown in Fig. 3, the vacuum switch is omitted and the line 37 is connected to a contact 54 which is engaged by a contact 55 on the throttle lever 43 to complete the circuit for the delayed spark when the throttle is wide open. As a result, the normal spark advance, with the throttle partially open, is as represented by the graph B^2 in Fig. 6 in which the vertical lines indicate various engine speeds and the horizontal lines indicate various degrees of advance, but, with the throttle open to its limit, the spark will be delayed as indicated by the graph A^2.

In the arrangement shown in Fig. 4, the contacts 38 and 45 are eliminated and the throttle lever 43 is connected by a link 56 with the plate 19 so that as the throttle is moved toward open position, the circuit breakers 15 and 16 are moved in a direction to progressively advance the spark. Thus for normal light load conditions, with the throttle partly open, an increase in the speed of the engine causes the spark to advance, as indicated by one of the graphs B^3 in Fig. 7 but, since this would be too great an advance for heavy load conditions, the contacts 54 and 55 are closed and the delayed spark is rendered operative when the throttle reaches wide open position, so that the spark advance will be as represented by the graph A^3.

From the foregoing description, it will be seen that the invention provides for automatic variation of the timing in accordance with load conditions, as well as engine. In providing for a delayed spark under certain possible temporary conditions, it makes it possible to maintain a more advanced spark under average conditions, with a consequent increase in efficiency, without causing a spark knock when such temporary conditions occur.

While I have shown several ways in which the best results may be approximated, it is understood that the invention is not limited to the specific construction shown, but includes all such modifications as may fall within the scope of the appended claims.

What I claim is:—

1. In an ignition timing device for internal combustion engines, means for normally advancing the spark progressively as the speed of the engine increases, and supplemental means, effective only when the throttle is wide open or in idling position, to cause a retardation of the spark with reference to the timing effected by the first mentioned means.

2. In an ignition timing device for internal combustion engines, means for normally advancing the spark progressively as the speed of the engine increases, supplemental means for causing a retardation of the spark with reference to the timing effected by the first mentioned means, and means for rendering said supplemental means ineffective except when the throttle is in idling position or when there is less than a predetermined degree of vacuum in the intake manifold of the engine.

3. In an ignition timing device for internal combustion engines, primary means for normally advancing the spark progressively as the speed of the engine increases, and supplemental means for retarding the advanced spark only when the throttle is opened to its limit.

4. In an ignition timing device for internal combustion engines, primary means for normally advancing the spark progressively as the speed of the engine increases, supplemental means for further advancing the spark as the throttle is opened wider, and means for delaying the spark as controlled by said primary means and supplemental means, whenever the throttle reaches its widest open position.

5. In an ignition timing device for internal combustion engines, an ignition circuit including two circuit breakers in parallel relation to each other and having overlapping closure periods with one breaking later than the other but before the other again closes, and means operable only when the throttle is between idling and full open position, to render the later circuit breaker ineffective to maintain a circuit after the other circuit breaker opens.

MARION MALLORY.